DO VENDORS INCLUDE TRANSACTION CHARACTERISTICS IN THEIR RISK ESTIMATION?
AN EMPirical ANALYSIS OF ERP Projects

Abstract

Using unique archival data on 81 projects from a major ERP vendor, we study whether transaction characteristics are included in the vendor’s estimation of risk to project profitability. We hypothesize that project size, contract type, strategic importance, and client familiarity are included in the risk estimations. Regression analysis suggests that, surprisingly, vendors do not include all transaction characteristics in their risk estimation: While we found that larger projects and fixed price (FP) contracts are significantly associated with the vendor’s risk estimation, strategic importance and client familiarity are not. Our data set also incorporates data on project profitability that presents us with the opportunity to test the efficiency of the risk estimation. We found that the vendor’s risk estimation is efficient with regard to project size and contract type. Finally, the efficiency analysis also suggests that vendors deliberately accept profitability losses when conducting strategic projects.

Keywords: Outsourcing, ERP project, Vendor perspective, Risk estimation, Profitability, Transaction characteristics, Strategic importance, Client familiarity
Introduction

With a volume of 23.3 billion US dollars in 2011, outsourced Enterprise Resource Planning (ERP) projects account for a considerable share of outsourced information systems (IS) projects (Gartner Research 2011). In outsourced ERP projects, vendors support clients in installing, parameterizing, integrating, testing, and upgrading pre-packaged ERP software (Aloini et al. 2007). In this context, the vendor’s risk estimation associated with project profitability is important information to support the vendor in taking managerial decisions, such as designing contractual provisions and setting up the governance of the project (Gefen et al. 2008).

Prior research shows that transaction characteristics affect risk factors (Gemino et al. 2008; Wallace et al. 2004; Yetton et al. 2000), project governance (Chen and Bharadwaj 2009; Gefen et al. 2008; Kalnins and Mayer 2004; Lee and Kim 1999; Poppo and Zenger 2002), and project outcome (Gopal et al. 2003; Nam et al. 1996) of IS projects. However, little work has been published on the effect of transaction characteristics of outsourced IS projects on the vendor’s risk estimation. Therefore, our research question is: Do vendors include transaction characteristics in their risk estimation? We hypothesize that project size, contract type, strategic importance, and client familiarity affect the vendor’s estimation of risk to profitability. We test these hypotheses using a unique data set on 81 projects obtained from a major ERP vendor. In addition, our data set provides us with the opportunity to test whether the vendor’s risk estimation is efficient with regard to information available on these transaction characteristics at the time of making the risk estimation.

Our analysis proceeds in two steps. First, we analyze the association between transaction characteristics and the vendor’s risk estimation. Surprisingly, not all transaction characteristics are significantly associated with the vendor’s risk estimation: While we found that larger projects and fixed price (FP) contracts are associated with higher risk estimations, we found no evidence to support an association between either strategic importance or client familiarity and the vendor’s risk estimation. Secondly, following the approach suggested by Gopal et al. (2003), we test the efficiency of the risk estimation by regressing transaction characteristics and the vendor’s estimation of risk to profitability. In the presence of the vendor’s risk estimation, there seems to be no systematic effect of the two factors influencing the vendor’s risk estimation, i.e., project size and contract type, on project profitability. Concerning the two factors not incorporated in the vendor’s risk estimation, i.e., strategic importance and client familiarity, only strategic importance is significantly associated with lower project profitability.

Our findings suggest that the vendor does not include all transaction characteristics in its risk estimation: Information about project size and contract type is incorporated into the risk estimation, while information about strategic importance and client familiarity is not. Our findings also suggest that the vendor’s risk estimation is efficient with respect to the two factors influencing it, i.e., project size and contract type: The vendor’s risk estimation incorporates all information related to project size and contract type available to the vendor at the time of making the estimation. Because strategic importance is not included in the vendor’s risk estimation but does have a significant negative effect on project profitability, we suggest that the vendor deliberately accepts lower project profitability when conducting strategic projects.

These results significantly contribute to the literature on outsourced IS projects. While it is accepted, that project size, contract type and client familiarity are important transaction characteristics of outsourced IS projects (Chen and Bharadwaj 2009; Gefen et al. 2008; Gopal et al. 2003; Kalnins and Mayer 2004), we know of no other study that empirically examines the effect of these transaction characteristics on the vendor’s risk estimation. Furthermore, our analysis highlights the strategic importance of a project in determining project profitability, a relationship not previously discussed in this context in the literature.

The remainder of this paper proceeds as follows. In section 2, we present the conceptual background of our research. Section 3 presents and summarizes related work on the effect of transaction characteristics in outsourced IS projects. In section 4, we derive our hypotheses. Section 5 describes the research methodology. Section 6 introduces a model of project profitability to test for the efficiency of the vendor’s risk estimation. In section 7, we discuss our results, study limitations, research contributions, and implications for practice. We provide our conclusive remarks in the paper’s final section.
**Related Literature on Transaction Characteristics**

Figure 1 depicts a commonly seen model of project outcome (e.g., Gemino et al. 2008; Wallace et al. 2004; Yetton et al. 2000) in which project outcome is dependent on transaction characteristics, risk factors, and project governance. While transaction characteristics are knowable before the transaction takes place, risk factors and project governance evolve during the transaction. With regard to transaction characteristics, three associations have been of particular interest to researchers: the association between transaction characteristics and risk factors, the association between transaction characteristics and project governance, and the association between transaction characteristics and project outcome.

Concerning the association between transaction characteristics and risk factors, researchers have acknowledged that risk factors evolve on the basis of transaction characteristics. For instance, Gemino et al. (2008) propose a temporal model of IS project outcome and find that transaction characteristics such as size or complexity are positively associated with emergent risk factors such as scope changes or project manager fluctuation. In a similar vein, Wallace et al. (2004) find that characteristics such as the use of new technology results in risk factors associated with project planning and control or the project team.

Concerning the association between transaction characteristics and relational project governance, a study by Poppo and Zenger (2002) investigated how prior relationships are related to relationship quality. Based on responses from 285 IS executives, the authors suggest that a more intense familiarity between client and vendor significantly improves relationship quality. Contrary to this, Lee and Kim (1999) found no significant effect of a longer duration of client/vendor relationship on intention to continue the relationship. Gefen et al. (2008) examined how the contract type affects contractual project governance in the form of penalty provisions. Based on a sample of 274 outsourcing contracts, regression analysis suggested that fixed price contracts are associated with higher penalties. Chen and Bharadwaj (2009) extended these results by showing that prior relationships are also positively associated with the number of contractual provisions (property rights provisions, dispute resolution provisions, and contingency provisions). Prior relationships between client and vendor seem to be positively linked to contract extensiveness suggesting that prior experience leads to a better understanding of mutual requirements and capabilities which in turn allows the contracting parties to draft a more comprehensive contract (Chen and Bharadwaj 2009).

Concerning the association between transaction characteristics and project outcome, Gopal et al. (2003) find that prior relationships, project size, and contract type are significantly associated with absolute vendor profits. Whereas larger projects and time and materials contracts seem to drive vendor profits, prior relationships have a negative effect. By showing that prior relationships are positively associated...
with the intention to continue risky projects, Nam et al. (1996) provide one possible reason for this negative effect of prior relationships on vendor profits.

Having access to a unique data set, we investigate whether vendors include transaction characteristics in their risk estimations and whether these estimations are efficient with regard to information available. In contrast to risk factors, transaction characteristics are knowable prior to a transaction and thus may be valuable indicators of a project’s overall risk.

**Conceptual Background**

In outsourced ERP projects, vendors support clients in installing, parameterizing, integrating, and testing pre-packaged ERP software or, after implementation, providing services such as maintaining, upgrading, or managing new releases (Aloini et al. 2007). We investigate the association between transaction characteristics of outsourced ERP projects and the vendor’s risk estimation regarding project profitability. Figure 2 depicts a highly simplified representation of an outsourced ERP project from a vendor’s perspective and illustrates events and information relevant to our research occurring at different points in time during the project.

From a vendor’s perspective, a project starts with the client issuing a request for proposal (RFP). Besides the requested scope of the project, the RFP conveys information about the volume of the project and the client’s preference for contract type (Gefen et al. 2008). The project volume indicates the estimated effort required for project completion and is a reasonable indicator for the size of a project (Sauer et al. 2007). While the project’s contract type is in theory the outcome of a contracting phase where both parties evaluate the risks and benefits associated with different contract types, the contract type is in practice often predetermined by the client in the RFP and not subject to negotiation during the contracting phase. There are two major types of contracts in outsourced IS projects: fixed price (FP) and time and materials (TM) contracts (Banerjee and Duflo 2000). While variations such as capped price (CP) contracts exist, FP and TM contracts are most common (Gopal et al. 2003). In FP contracts, the vendor agrees to deliver the project as specified by the client for a predefined price. In TM contracts, the vendor is paid on an hourly basis based on agreed rates. The vendor’s revenues (and the client’s costs, respectively) are not predetermined at the time of contract closure in TM contracts (Kalnins and Mayer 2004).

Beyond the explicitly stated information on project volume and contract type, the vendor evaluates client familiarity which refers to its knowledge about the client and the client’s trustworthiness based on prior relationships (Gefen et al. 2008; Gulati 1995). Using all collected information, the vendor decides if the project is of strategic importance in addition to the project’s financial objectives. The strategic importance
of the project to the vendor is reflected in objectives such as winning an important reference client, entering a new market, introducing a new technology, or establishing long-term relationships with the client.

This initial understanding of the transaction characteristics of the project marks the starting point of the contracting phase. One important event occurring during the contracting phase is the risk estimation meeting the purpose of which is to estimate the profitability risk of a project. The vendor’s risk estimation provides information to support managerial decisions made later during the contracting phase (Gefen et al. 2008).

The signing of the contract marks the end of the contracting phase and the beginning of the delivery phase during which the vendor supports the client in implementation or post-implementation activities. At the end of the project, the vendor should be able to calculate project profitability by dividing project profits by project revenues.

**Research Hypotheses**

Figure 3 gives an overview of our research hypotheses on how vendors include transaction characteristics in their risk estimations.

![Figure 3. Research Model](image)

Project size has been identified as an important determinant of IS project risk (McFarlan 1981) and subsequent empirical evidence has substantiated this claim. Similar to arguments presented by Yetton et al. (2000), Gemino et al. (2008) also argue that project size increases complexity and task interdependence as well as volatility in IS projects and thus negatively affects performance. In their analysis of the effect of four components of project size (effort, duration, volume, team size) on project performance, Sauer et al. (2007) add that the link between size and performance may not be as direct as commonly thought. Their results suggest that: a) regardless of project size a baseline risk exists, b) the various components of size affect performance in a different way, and c) an increase in project size does not necessarily increase the risk of underperformance. Despite these restrictions we argue that larger projects tend to be more difficult to plan and to control and, due to their size, bear greater financial risk for the vendor. Consequently, we hypothesize:

**Hypothesis 1 (H1): Larger projects are associated with higher risk estimation.**

Formal contracting is an important aspect of client vendor relationships in outsourced IS projects. A formal contract represents a “written contractual and management-initiated mechanisms designed to guide behavior toward desired objectives” (Goo et al. 2009). Formal contracts determine how risks are shared between vendor and client (Lacity and Hirschheim 1993), have an impact on how projects are managed (Gopal and Sivaramakrishnan 2008), and affect project outcome (Ramachandran and Gopal...
In FP contracts, the risk of budget and schedule overruns is borne by the vendor, in TM contracts by the client. Furthermore, although in theory FP contracts offer the vendor the chance to leverage information asymmetries and thus achieve higher profitability, average vendor profits seem to be higher in TM contracts (Gopal et al. 2003). With this in mind, we suggest that FP contracts increase the vendor’s risk estimation:

**Hypothesis 2 (H2):** Fixed price contracts are associated with higher risk estimation.

Investigating the determinants of IS project performance, Yetton et al. (2000) find empirical evidence that risk is a function of the strategic importance of a project. Following Yetton et al. (2000), we conceptualize strategic projects as business-critical projects with other than short-term financial objectives. For instance, vendors may conduct strategic projects in order to win important reference clients, to enter new markets, to test new technologies, or to generate follow-up projects. In these cases - though still important - financial success becomes a second priority. Due to their high visibility in the market, failing to successfully deliver strategic projects may cause long-term damage to reputation and affect the vendor’s future business potential. In addition, because of the high criticality of strategic projects, the vendor might be more likely to make concessions during the contracting phase, resulting in more unfavorable terms and conditions. Both factors should drive the vendor’s risk estimation. Thus, we hypothesize:

**Hypothesis 3 (H3):** Strategic projects are associated with higher risk estimation.

In their study on risk mitigation in outsourced IS projects, Gefen et al. (2008) suggest that familiarity may reduce risk in client vendor relationships. According to Gefen et al. (2008), familiarity may influence risk through two aspects, knowledge and trust. The authors argue that the knowledge-related aspect of familiarity reduces information asymmetries and, consequently, risk during the contracting phase (Gefen et al. 2008). Through repetitive partnerships, client and vendor get to know each other’s capabilities, business environments and cultures which facilitates more exact estimation of cost and better allocation of resources (Kalnins and Mayer 2004). The trust-related aspect that evolves from familiarity is important as it facilitates cooperation between client and vendor during the delivery phase of the project (Gefen et al. 2008). Trust increases the chance that both parties will take constructive steps towards achieving common goals and reduces opportunistic behavior and the need for control (Gulati 1995). Both the knowledge- and trust-related aspect of familiarity seem to be particularly valuable in ERP projects because these projects are typically knowledge-intensive and require considerable cooperation between client and vendor (Markus and Tanis 2000). Thus, we hypothesize:

**Hypothesis 4 (H4):** Greater client familiarity is associated with lower risk estimation.

**Methodological Approach**

**Research Site and Data Collection**

Our industry partner ALPHA is a major vendor in the ERP software market. ALPHA develops and distributes its software and offers implementation and post-implementation services to clients from a broad range of industries. These services are organized as projects.

Project risk management at ALPHA is an integral part of the project management process. The primary goal of project risk management is to promote successful projects with a focus on project profitability. To this end, an independent organizational risk management unit supervises projects exceeding a volume threshold of € 250,000. The objectives of risk management at ALPHA comprise: (a) early detection of project risks, (b) providing transparency on risks to internal project stakeholders, and (c) control and mitigation of risks to keep additional costs at a minimum.

In projects which are subject to ALPHA’s project risk management a risk estimation meeting takes place during the contracting phase (Figure 2). The risk estimation meeting follows standard risk management practices as proposed by Boehm (1991) or Charette (1996) and comprises identification, assessment, control, and monitoring of project risks. Risk estimation meetings are initiated and moderated by the independent risk management unit. Participants come from various organizational units such as finance and accounting, project management, or legal. Depending on the circumstances, the review meeting is either held via telephone or in person. In either case, the risk estimation meeting is guided by a
standardized spreadsheet, which captures transaction characteristics and other risk relevant information about the project. It includes the client’s name and industry, a one-paragraph project summary, ALPHA’s project objectives, the contract type, and the project volume in Euro. The risk estimation is established by classifying the project as low, medium, or high risk. Most importantly, this risk estimation does not express an individual opinion but rather reflects the results of a systematic group discussion in the risk estimation meeting. The vendor’s risk estimation serves as an important management reporting tool in regular internal steering committee meetings.

We tested our hypotheses on data from 81 ERP projects completed by ALPHA between 2005 and 2010 and exceeding € 250,000. Thus, these projects were subject to the supervision by the independent risk management unit as described above. In total, risk estimation meeting spreadsheets from 923 projects were available for our study. As the 923 projects contained projects, which were still in various planning phases or ongoing, we narrowed our data set to 81 completed projects. The risk estimation meeting spreadsheets of these 81 projects provided the basis for our analysis. Our projects stem from 65 different clients spanning a broad range of industries with a focus on automobile and components (12 projects), banks (11 projects), utilities (11 projects), and capital goods (8 projects). Variable descriptions and descriptive statistics are shown in Table 1.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Descriptions</th>
<th>Unit / scale</th>
<th>Mean (SD)</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project size</td>
<td>The estimated volume of the project as stated in the RFP (Sauer et al. 2007)</td>
<td>'000s, €</td>
<td>2,234.47 (3,787.28)</td>
<td>81</td>
<td>22,200</td>
</tr>
<tr>
<td>Contract type</td>
<td>Indicator of whether the contract type is FP (0) or TM (1)</td>
<td>Binary variable</td>
<td>0.37 -</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Strategic importance</td>
<td>Indicator of whether the project is of strategic importance (1) or not (0)</td>
<td>Binary variable</td>
<td>0.60 -</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Client familiarity</td>
<td>Familiarity between client and vendor as indicated by the number of prior projects with the same client (Gefen et al. 2008)</td>
<td>Number of prior projects</td>
<td>2.21 (3.03)</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Project duration</td>
<td>Actual duration of the project in days between the signing of the contract and the end of the project</td>
<td>Number of days</td>
<td>417.5 (309.8)</td>
<td>60</td>
<td>1,705</td>
</tr>
<tr>
<td>Risk estimation</td>
<td>Indicator of whether the project is classified as low (1), medium (2), or high (3) risk project</td>
<td>3-point scale</td>
<td>1.40 (0.54)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Project profitability</td>
<td>Project profits divided by project revenues</td>
<td>Percent</td>
<td>29 (20)</td>
<td>-84</td>
<td>61</td>
</tr>
</tbody>
</table>

SD = Standard deviation.

The project volume in Euro was extracted as explicitly stated in the risk estimation meeting spreadsheet as was the contract type (FP or TM) and the vendor’s risk estimation (high, medium or low). With regard to contract type, CP contracts were coded as FP contracts as they also put an upper limit on the project’s volume. These characteristics were explicitly stated in the spreadsheets and thus were not subject to our interpretation.

1 Two projects in our sample are below this threshold with a project volume of € 81,000 and € 100,000, respectively. As these projects, with the exception of their low volume, do not feature any peculiar characteristics, we kept them in our sample.
A project’s strategic importance to the vendor was assessed separately by two authors based on ALPHA’s project objectives and the project summary as recorded on the spreadsheet. For each project ALPHA recorded up to three project objectives ordered by descending priority. Projects were coded as being strategic if, for example, ALPHA aimed at winning back a client from a competitor, entering a new market, or acquiring follow-up projects. In the case of contradictory objectives, we used the primary objective to code the project. Coding examples can be found in the appendix (Table 5). After both authors completed the coding, we used Cohen’s Kappa (Cohen 1960) to determine inter-rater reliability. Following the labels attached by Landis and Koch (1977), our initial Cohen’s Kappa of 0.62 indicated “substantial” agreement among the authors. The 15 disagreements between the first and the second author could easily be resolved in a second round of coding. In addition, we clarified our coding scheme in a post-hoc discussion with our industry partner. While the industry partner was positive about the coding scheme in general, it was noted that the project objectives are usually entered by the bid team into the risk estimation meeting spreadsheet and thus may represent its specific perspective on the project.

We followed the suggestion by Gefen et al. (2008) and calculated client familiarity as the number of previous projects ALPHA had with the client at the time of conducting a given project. As we did not have access to projects conducted prior to 2005, our measure should be seen as a lower boundary of client familiarity. Thus, in order to mitigate the bias that inevitably results from this temporal restriction, we took all 923 projects into account when calculating client familiarity (Gefen et al. 2008).

To test for the efficiency of the vendor’s risk estimation, we collected financial data including all revenues and expenses accumulated during the project and the dates of all orders related to the project. Using this approach, common method bias is minimized as revenues and expenses stem from a different data source than the transaction characteristics (Podsakoff et al. 2003). Project profitability was calculated as the share of total project profits, i.e. total project revenues minus total project expenses, on total project revenue. Notably and in contrast to Gopal et al. (2003), we are able to calculate relative instead of absolute project profits and thus provide a more accurate picture of vendor profitability. Project duration was calculated as the number of days between the signing of the contract and the end of the project.

Data Analysis

Our hypotheses were tested using the following ordered probit specification:

\[
\text{vendor risk estimate}_i = \beta_{1i} \log(\text{project size}_i) + \beta_{2i} \text{contract type}_i + \beta_{3i} \text{strategic importance}_i + \beta_{4i} \log(\text{client familiarity}_i + 1) + \epsilon_i
\]

where \(i\) indexes the individual projects and \(\epsilon_i\) is an error term. Based on the variable distributions, we transformed project size and client familiarity by taking the logarithm. This transformation is a common procedure in empirical IS research to reduce the skewness of variables (e.g., Gefen et al. 2008; Rai et al. 2012; Ramasubbu et al. 2008).

The specification was estimated using maximum likelihood. Because the error terms may not be independent as some clients engaged in multiple projects, we clustered the error terms by client. We tested for influential observations using Cook’s distance and identified six observations as outliers according to the upper threshold of \(4/n\) recommended by Hamilton (2006). Estimation results are shown in Table 2 and clustered standard errors are given in parentheses. The relationship of transaction characteristics and risk estimations using the full sample size and the results for the outlier-corrected sample are presented in the table. To test for multicollinearity we calculated the variance inflation factors (VIF) for each independent variable. The highest VIF was 1.17, which is lower than the recommended upper threshold of 10 (Hair et al. 2006), indicating acceptable multicollinearity. There was no significant endogeneity.

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2 As an additional robustness check we also estimated the model using an ordinary least squares specification. The results were consistent with those of the ordered probit specification depicted in Table 2.

3 As suggested by Gopal and Sivaramakrishnan (2008) and (Gopal et al. 2003), one candidate for endogeneity would appear to be contract type. To test for endogeneity we used Heckman’s two stage procedure (Heckman 1979) as outlined in Hamilton and Nickerson (2003). In the first stage, a probit specification was used to assess the effects of project size, strategic importance, and client familiarity on contract type. Based on these results, we calculated the inverse Mill’s ratio. In the second stage, the vendor’s risk estimate was estimated as a function of project size, contract type, strategic importance, and client familiarity, as well as the inverse

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Table 2. Transaction Characteristics and the Vendor’s Risk Estimation, Ordered Probit Models

<table>
<thead>
<tr>
<th>Variables</th>
<th>Full sample</th>
<th>Outlier-corrected sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=81)</td>
<td>(n=74)</td>
</tr>
<tr>
<td>log(Project size)</td>
<td><strong>0.563</strong>*</td>
<td><strong>1.026</strong>*</td>
</tr>
<tr>
<td></td>
<td>(0.187)</td>
<td>(0.240)</td>
</tr>
<tr>
<td>Contract type</td>
<td>-<strong>0.875</strong>*</td>
<td>-<strong>1.480</strong>*</td>
</tr>
<tr>
<td></td>
<td>(0.315)</td>
<td>(0.409)</td>
</tr>
<tr>
<td>Strategic importance</td>
<td>-0.143</td>
<td>-0.048</td>
</tr>
<tr>
<td></td>
<td>(0.263)</td>
<td>(0.335)</td>
</tr>
<tr>
<td>log(Client familiarity + 1)</td>
<td>-0.900</td>
<td>-0.396</td>
</tr>
<tr>
<td></td>
<td>(0.240)</td>
<td>(0.260)</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-50.66</td>
<td>-34.19</td>
</tr>
<tr>
<td>Chi-square</td>
<td>13.10**</td>
<td>23.81***</td>
</tr>
<tr>
<td>d.f.</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Pseudo-R²</td>
<td>0.17</td>
<td>0.18</td>
</tr>
</tbody>
</table>

d.f. = Degrees of freedom. *** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level, for two-tailed tests. Clustered standard errors are in parentheses.

Concerning the model estimated on the full sample a chi-square of 13.10 and a Pseudo-R² of 0.17 indicate a good fit of the overall model which is significant at p <0.05. The results provide strong support for our hypotheses H1 (Larger projects are associated with higher estimations of risk) and H2 (Fixed price contracts are associated with higher estimations of risk). Strategic importance and client familiarity seem to have no effect on the vendor’s risk estimation, not supporting H3 and H4, respectively. The model estimated on the outlier-corrected sample produces even greater effect sizes and significance levels for project size and contract type, indicating robustness of the results.

Efficiency-Test of the vendor’s risk estimation

Our data set presents us with the unique opportunity to test the efficiency of ALPHA’s risk estimation. In this context, the risk estimation of ALPHA is said to be efficient with regard to the transaction characteristics if it incorporates all information related to the transaction characteristics available to ALPHA at the time of estimation. Following the econometric framework outlined in Gopal et al. (2003), any deviation in realized project profitability should result from contingencies that are unanticipated and thus not incorporated in ALPHA’s risk estimation. Therefore, we hypothesize that in the presence of the vendor’s risk estimation there should be no significant effect of the variables representing the transaction characteristics known at the time of estimation. We used the following linear specification to test this efficiency hypothesis:

\[
project \ profitability_i = a_i + \beta_{1i} \log(project \ duration_i) + \beta_{2i} \text{ vendor risk estimate}_i + \beta_{3i} \log(project \ size_i) + \beta_{4i} \text{ contract type}_i + \beta_{5i} \text{ strategic importance}_i + \beta_{6i} \log(client \ familiarity_i + 1) + \epsilon_i
\]

where \(i\) indexes the individual projects and \(\epsilon_i\) is an error term. Following Gopal et al. (2003) we included the actual project duration, representing an ex-post “performance” variable, in the model to add power to the tests. We again used logarithmic transformations to reduce the skewness of the variables project duration, project size, and client familiarity. The specification was estimated using ordinary least squares. As outlined in the preceding section we clustered the error terms by client. Using Cook’s distance for this

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Mill's ratio as an additional variable. The inverse Mill’s ratio was not significant indicating no significant endogeneity (Shaver 1998).
model, we identified three observations as outliers according to the upper threshold of $4/n$ recommended by Hamilton (2006). Estimation results are shown in Table 3 and clustered standard errors are given in parentheses. The effects of project duration, transaction characteristics and risk estimations on realized project profitability using the full sample size and the results for the outlier-corrected sample are presented in the table. To test for multicollinearity we calculated the VIF for each independent variable. The highest VIF was 1.47, which is lower than the recommended upper threshold of 10 (Hair et al. 2006), indicating acceptable multicollinearity. There was no significant endogeneity.

Table 3. Efficiency Test of the Vendor’s Risk Estimation, Ordinary Linear Models

<table>
<thead>
<tr>
<th>Variables</th>
<th>Full sample (n=81)</th>
<th>Outlier-corrected sample (n=78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(Project duration)</td>
<td>-4.898 (3.617)</td>
<td>-3.249 (2.224)</td>
</tr>
<tr>
<td>Risk estimation</td>
<td>-12.109** (5.538)</td>
<td>-5.365** (2.359)</td>
</tr>
<tr>
<td>log(Project size)</td>
<td>-1.900 (1.810)</td>
<td>-1.370 (1.326)</td>
</tr>
<tr>
<td>Contract type</td>
<td>0.776 (3.946)</td>
<td>0.192 (2.929)</td>
</tr>
<tr>
<td>Strategic importance</td>
<td>-9.107** (3.733)</td>
<td>-5.324** (2.640)</td>
</tr>
<tr>
<td>log(Client familiarity + 1)</td>
<td>0.682 (2.316)</td>
<td>0.766 (1.475)</td>
</tr>
<tr>
<td>Constant</td>
<td>105.327** (41.667)</td>
<td>79.659*** (24.563)</td>
</tr>
<tr>
<td>F</td>
<td>1.62</td>
<td>2.29**</td>
</tr>
<tr>
<td>d.f.</td>
<td>6, 64</td>
<td>6, 61</td>
</tr>
<tr>
<td>R²</td>
<td>0.27</td>
<td>0.22</td>
</tr>
</tbody>
</table>

d.f. = Degrees of freedom. *** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level, for two-tailed tests. Clustered standard errors are in parentheses.

Concerning the model estimated on the full sample, a $R^2$ of 0.27 indicates a good fit. In presence of ALPHA’s risk estimation, project size, contract type and client familiarity seem to have no effect on project profitability. A higher risk estimation and projects with strategic importance to the vendor are significantly associated with lower project profitability. Overall the results indicate that the vendor’s risk estimation is efficient with regard to project size and contract type. The model estimated on the outlier-corrected sample produces lower effect sizes for the risk estimation and strategic importance but is consistent with the results obtained using the full sample which indicates robustness of the results.

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4 As described above we tested contract type for endogeneity using Heckman’s two stage procedure (Heckman 1979) The inverse Mill’s ratio was again not significant indicating no significant endogeneity (Shaver 1998).
Discussion

Summary of Results

The underlying rationale of our study was to examine whether vendors include transaction characteristics in their risk estimations. Using a unique archival data set of 81 projects from a major ERP vendor, our results show that not all of the four investigated transaction characteristics are included in the vendor’s risk estimations. While larger projects and fixed price contracts are significantly associated with higher estimations of risk, lending support to H1 (Larger projects are associated with higher estimations of risk) and H2 (Fixed price contracts are associated with higher estimations of risk), strategic importance and client familiarity are not included, not supporting H3 (Strategic projects are associated with higher estimations of risk) and H4 (Greater client familiarity is associated with lower estimations of risk), respectively.

Given that project size has been shown to correlate with complexity, volatility, and task interdependence (Gemino et al. 2008; Yetton et al. 2000) and fixed price contracts transfer the risk of budget overruns to the vendor (Banerjee and Duflo 2000; Ethiraj et al. 2005; Gopal et al. 2003) respectively, it is not surprising that risk managers at ALPHA regard these characteristics as important threats to profitability.

With regard to strategic importance and client familiarity our findings are more surprising: While Yetton et al. (2000) suggest that strategic importance is positively associated with risk, our results show that strategic importance is not included in the vendor’s risk estimations. We argue that when pursuing strategic goals, such as winning reference clients or entering new markets, vendors deliberately accept lower project profitability. Thus, the effect of strategic importance on project profitability is compensated for and subsequently not part of the vendor’s risk estimations.

Concerning client familiarity, Gefen et al. (2008) argue that familiarity between clients and vendors in outsourced IS projects mitigates risk through increased knowledge and trust. Interestingly and contrary to the reasoning presented in Gefen et al. (2008), we found that client familiarity is not significantly associated with lower estimations of risk. One possible reason for this is that knowledge gained from increased familiarity is not be directly reflected in the vendor’s risk estimation but rather affect how future relationships are managed in terms of contractual governance. This is in line with empirical evidence presented in Kalnins and Mayer (2004), and Gopal et al. (2003). Post-hoc interviews substantiated this line of argumentation: ALPHA risk managers are primarily concerned with project profitability, which is a matter of contractual governance and thus not impacted by the degree of familiarity between vendor and client.

Our data set incorporated ex-post data on profitability that presented us with the unique opportunity to test the efficiency of the vendor’s risk estimation. Efficiency of the vendor’s risk estimation implies that the risk estimation incorporates all available information that relates to the transaction characteristics included in the risk estimation, i.e., project size and contract type, and that is known at the time of estimation. The efficiency test substantiates this hypothesis with regard to the these two transaction characteristics. In the presence of the vendor’s risk estimation both transaction characteristics do not significantly affect profitability.

The efficiency test also shows that strategic projects are significantly associated with lower project profitability. In line with this, post-hoc interviews substantiated the notion that ALPHA is willing to accept profitability losses in the case of strategic projects.

Limitations

Our study is subject to several limitations. First, because we analyzed data from one company only, there may be issues concerning the representativeness of our results. ALPHA’s organizational context may not be comparable to other companies that provide ERP implementation- and post-implementation services. In this regard, particularly the fact that ALPHA does not only offer services to its clients, but also develops and distributes its own ERP software differentiates ALPHA from other ERP service providers. However, we argue that this organizational difference does not affect the generalizability of our findings. We can think of no reason why the nature of the associations between project size, contract type, client familiarity, strategic importance and the risk estimation should change for other ERP service providers.
Solely, ALPHA’s conceptualization for strategic importance may differ from those of other ERP service providers. For instance, ALPHA may also consider service projects as strategic that are primarily conducted in order to sell software licences.

Secondly, data are only available for projects exceeding € 250,000 and thus supervised by ALPHA’s risk management unit. Our sample is therefore slightly biased towards larger projects. Because of the considerable costs associated with a formal risk management process, the practical implications of our paper may not be applicable to smaller projects.

Thirdly, this study examined outsourced ERP projects as a specific type of outsourced IS projects. Amongst other things, ERP projects are specific with regard to their high degree of client-vendor interaction and organizational change, the need to integrate with legacy systems, and the deployment of pre-packaged software (Markus and Tanis 2000). Hence, generalization to other types of IS projects, such as outsourced software development projects, may require additional research.

Fourthly, the set of transaction characteristics that are included in this study is restricted by the information given in ALPHA’s archival data set. Notwithstanding that we have included heavily discussed transaction characteristics in the IS literature such as project size, contract type, and client familiarity our set of transaction characteristics is not theoretically complete and important transaction characteristics such as task complexity and asset specificity are missing. However, as our research objective was to analyze whether vendors include transaction characteristics in their risk estimation, theoretical completeness of the transaction characteristics is not absolutely essential. Nevertheless, since our analysis revealed that vendors do not include all transaction characteristics in their risk estimation, future research should investigate the inclusion of further transaction characteristics.

Fifthly, as discussed in the data collection section, the project objectives based on which the projects’ strategic importance is coded are entered by the bid team that negotiates the project contracts. Post-hoc interviews with ALPHA risk managers revealed that this perspective may in some cases differ from the projects’ actual strategic importance: The bid team may overstate the strategic importance in order to justify poorly negotiated contracts with low profitability prospects. This case offers an alternative explanation for our results: Being aware of the bid team’s behavior, risk managers would not incorporate the bid team’s perspective on a project’s strategic importance into their risk estimation. Also, poorly negotiated contracts with an overstated strategic importance would drive the association between strategic importance and lower project profitability. In a subsequent study we will clarify this issue by having ALPHA’s risk managers code the projects’ strategic importance, providing us with an additional perspective.

Finally, our results were dependent on the quality of ALPHA’s archival data. As risk management is often seen as a burden which creates ‘extra work and expense’ (Verner and Evanco 2005), the possibility exists that the risk estimation meeting spreadsheets were not carefully maintained by the risk managers, although we found no evidence to support this suspicion. Instead, our post-hoc interviews highlighted the considerable value ALPHA attributes to the risk management process in general and the risk estimation in particular. In addition, the comprehensiveness of comments provided in the free text fields in the spreadsheets suggests a reasonably high quality of data. Other authors explicitly emphasize the value of comprehensive archival data (Ropponen and Lytyinen 1997), which may be better suited for investigating perceptual data than surveys or interviews due to the avoidance of recall bias (Mitchell and Thompson 1994).

**Contributions to Research**

We see two major contributions to research. First, our study is one of the first attempts to empirically analyze transaction characteristics that shape the vendor’s risk estimation in the context of outsourced ERP projects. There is considerable research on transaction characteristics and their effect on risk factors (Gemino et al. 2008; Wallace et al. 2004; Yetton et al. 2000), project governance (Chen and Bharadwaj 2009; Gefen et al. 2008; Gopal et al. 2003; Kahnins and Mayer 2004; Lee and Kim 1999; Poppo and Zenger 2002), and project outcome (Gopal et al. 2003; Nam et al. 1996). This study adds the vendor’s risk estimation as another important aspect affected by transaction characteristics. Furthermore, we tested the efficiency of the vendor’s risk estimation by investigating the effect of transaction characteristics and the risk estimation on project profitability.
The second contribution of our research is that we highlight the strategic importance of projects from a vendor’s perspective as an important construct in the context of client-vendor relationships. Strategic importance indicates that objectives such as winning important reference clients, entering new markets, testing new technologies, or generating follow-up projects are vital for vendors. Our results substantiate the notion of ‘must-have projects’ and strategic vendor behavior. To the best of our knowledge, prior research on outsourced IS projects has only partially addressed strategic importance by focusing on aspects such as future business potential (Gopal et al. 2003).

The value of these contributions is substantiated by the unique archival data set on which our analysis is based. Previous studies on outsourced IS projects mainly relied on post-hoc surveys. Using archival data potentially rules out common method bias (Podsakoff et al. 2003) and may provide better estimations of path coefficients and explained variance (Gefen et al. 2008). Some authors have examined archival data similar to ours (Gefen et al. 2008; Kalnins and Mayer 2004) from either a client perspective or not in the context of outsourced ERP projects. To the best of our knowledge, this is the first time that vendor profitability was analyzed in terms of the realized margin instead of absolute profits (Gopal and Sivaramakrishnan 2008; Gopal et al. 2003) or perceptional measures (Ramachandran and Gopal 2010). Our data set provided also us with the opportunity to assess strategic importance as indicated by ALPHA’s project objectives.

**Implications for Practice**

Our results suggest that project size and contract type are central constituents of the vendor’s risk estimation. For vendors, larger projects and fixed price contracts seem to bear more risk. Given ALPHA’s overall success in the market, IT managers at other vendors may find it useful to emphasize these aspects when estimating project risk.

The efficiency of the vendor’s risk estimation implies that the vendor seems to have a good intuition about risks that stem from project size and contract type. As in ALPHA’s case successful managerial decisions were based on the risk estimation, our analysis may serve as an illustration of the potential benefits of formal project risk management (Boehm 1991; Charette 1996). This finding may be valuable for other IS project vendors who think about introducing formal risk management.

Finally, our findings provide evidence for strategic vendor behavior during the contracting phase. Although our analysis does not allow us to judge ALPHA’s priority concerning the respective strategic objectives, it becomes clear that ALPHA deliberately relaxes profitability requirements when strategic considerations come into play. Again, given ALPHA’s overall success in the market, this finding highlights the importance of objectives, other than financial ones, and long-term orientation for IS project vendors.

**Conclusion**

Based on the analysis of 81 outsourced ERP projects, we sought to answer the research question: *Do vendors include transaction characteristics in their risk estimations?* Therefore, we related transaction characteristics to the vendor’s risk estimation. Notably, our results show that not all transaction characteristics are included in the vendor’s risk estimation. While we found that larger projects and fixed price (FP) contracts are included in the vendor’s risk estimation, strategic importance and client familiarity are not. Furthermore, we tested the efficiency of the vendor’s risk estimation by linking it to project profitability. Our findings suggest that the vendor’s risk estimation is efficient with regard to the two characteristics included in the risk estimation, i.e., project size and contract type.

Finally, we found that strategic importance significantly affects project profitability but is not included in the vendor’s risk estimation. This suggests that in strategic projects, vendors deliberately accept lower project profitability and adjust their margin requirements prior to estimating project risk. Future research should look into this particular transaction characteristic in more detail. The investigation of various strategic objectives and how much profitability loss the vendor is willing to take seems especially promising.
## Appendix

### Table 4. Correlation Matrix

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Client familiarity</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Contract type</td>
<td>-0.151</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Project size</td>
<td>-0.155</td>
<td>0.252**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Strategic importance</td>
<td>-0.019</td>
<td>-0.008</td>
<td>0.258**</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Risk estimation</td>
<td>-0.087</td>
<td>-0.183</td>
<td>0.387***</td>
<td>0.077</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>(6) Project profitability</td>
<td>0.094</td>
<td>0.054</td>
<td>-0.286**</td>
<td>-0.273**</td>
<td>-0.412***</td>
<td>1.000</td>
</tr>
<tr>
<td>(7) Project duration</td>
<td>-0.119</td>
<td>-0.031</td>
<td>-0.008</td>
<td>-0.009</td>
<td>0.141</td>
<td>-0.224**</td>
</tr>
</tbody>
</table>

*** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level for two-tailed tests.

### Table 5. Coding Scheme for Strategic Importance

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Non-strategic projects as characterized as business-by the following keywords in ALPHA project objectives or project summary: revenue, profitability, commercial goals, and utilization.</td>
<td>• “Revenues and contribution” &lt;br&gt;• “Generate revenues with a margin above x% and utilize associates” &lt;br&gt;• “Financial success”</td>
</tr>
<tr>
<td>1</td>
<td>Strategic projects as characterized by the following keywords in ALPHA project objectives or project summary: market entrance, market development, reference client, win-back, lighthouse project, follow-up projects, product development, and reputation.</td>
<td>• “Lighthouse project in the healthcare industry, potential role model for other clients” &lt;br&gt;• “Strategic positioning for larger projects” &lt;br&gt;• “Securing a considerable licence deal”</td>
</tr>
</tbody>
</table>
References


